



## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: REENY T. SEBASTIAN, ET AL. )  
 SERIAL NUMBER: 09/989.486 ) Group Art Unit: 2856  
 FILED: NOVEMBER 20, 2001 ) Before the Examiner:  
 FOR: REAR STEERING SENSOR ) BRAIN J. BROADHEAD  
 DIAGNOSTIC ALGORITHM FOR )  
 FOUR-WHEEL STEERING )  
 SYSTEMS )

Commissioner for Patents  
 P.O. Box 1450  
 Alexandria, VA 22313-1450

**DECLARATION OF PRIOR INVENTORSHIP IN THE UNITED STATES  
TO OVERCOME CITED ART (37 C.F.R. § 1.131)**

This declaration is to establish conception of the invention in the present application in the United States, at a date prior to December 7, 2000, which is the effective (filing) date of U.S. Patent Application Publication 2001/0004720 A1, cited by the Examiner.

We, the undersigned inventors, Reeny T. Sebastian, Karen A. Boswell and Brian D. Lemanski declares and says that:

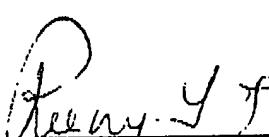
1. We are the sole inventors of the invention claimed in the above-identified patent application.
2. We conceived in the United States the invention disclosed and claimed in the above-identified patent application prior to December 7, 2000, and then worked on diligently reducing the invention to practice in the United States by filing the above-identified application.

3. As evidence in support of this prior conception and reduction to practice, submitted herewith is the following evidence of activity done in the United States.

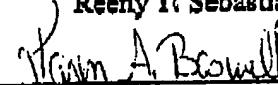
The Exhibit is a copy of a Delphi Record of Invention, assigned Docket No. DP-304592, dated prior to December 7, 2000 (with the date redacted), prepared by the inventors and witnessed (also prior to December 7, 2000), which clearly included a detailed description and sketches, which show conception of the invention.

4. The undersigned declares that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 101 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

Date: 13 MY 05

  
Reeny T. Sebastian

Date: 16 MY 05

  
Karen A. Boswell

Date: 13 MY 05

  
Brian D. Lemaniski



File Number:	<u>DP-304592</u>
Product Code:	<u>DSQUAD</u>
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## Record of Invention and Request for Intellectual Property Investigation

This Record of Invention provides written documentation of your invention and initiates a process that may result in the filing of a patent application.

Delphi Unit: Delphi Saginaw Steering Site/Location: Delphi Saginaw

Product group this invention applies to: EPS

Invention Title: Rear sensor Diagnostics for Quadrasteer

To disclose and record your invention, provide the following information:

*To the best of your present knowledge, describe the background of your invention. Briefly describe the prior apparatus, material or process that is improved, replaced or most similar to your invention. What are the problems or shortcoming of the prior apparatus, material or process that are overcome by your invention?*

Quadrasteer system uses a rear sensor mounted on the pinion to measure the absolute position of the rear wheels. Rear sensor signal 1 is used for initialization, and signal 2 is used for more accurate measurement. If the sensor signals are intermittent, shorted to ground, battery, open or to each other it will cause the reading to be corrupted and hence the rear wheel angle estimation to be incorrect. This diagnostic algorithm will detect any of these issues, thus preventing an unintended steer.

2. *Describe your invention. Provide enough detail of the specific new features, components or steps that form the invention to enable a technical understanding of its content and novelty. Include a drawing with reference numbers keyed to your text description. Explain how your invention differs from and improves or solves the problems of the prior apparatus, material or process described above.*

In the quadrasteer system the rear wheel angle is measured by a sensor which has 2 sensor signals 1 and 2 as shown in Fig(1). The diagnostics implemented in this algorithm determines whether the rear sensor signal1, and signal2 are in the specified range. This will protect the system from the sensor signals being shorted to battery, shorted to ground and open etc. The 2nd part of the algorithm looks for correlation between the signals 1 and signal2. Signal2 can be of the same value, but in different window ranges as shown in Fig(1). This diagnostics protects the system from rear conditions of the sensor signals 1 and 2 shorted to each other and so on.

Fig(2) shows the block diagram for range diagnostics and correlation diagnostics implemented in X-math. The inputs are sensor signals 1 and 2 varying with time. The simulation results are attached in Fig(3). This shows how as the sensor signals are varied , the range and correlation faults are triggered.

To help establish the date and status of your invention, provide the following information:

3. Date this invention was first thought of: \_\_\_\_\_
4. Attach a copy of the first written description and/or sketch of the invention. (preferably signed, dated & witnessed).
5. Date this invention was or is expected to be disclosed outside of Delphi: \_\_\_\_\_  
If disclosed, to whom: (customer, supplier, public, etc.) GM Truck \_\_\_\_\_
6. Date this invention was used or is committed to be used in production: \_\_\_\_\_
7. Date this invention or a system including or using this invention was or will be offered for sale outside Delphi: \_\_\_\_\_
8. Does this invention relate to a Government Contract? Yes  No   
If yes, identify the government Contract/Purchase Order No. \_\_\_\_\_

If a patent application is to be filed on your invention, you may be contacted to provide (1) further information about your knowledge of prior art or events that might affect our ability to obtain a patent and (2) a more complete or updated description of what you consider to be the best mode of carrying out your invention.

**Inventor #1**

Name: Reeny	T	Sebastian	Citizen of: USA
First Name	Middle Initial	Last Name	
Social Security No. 219-13-5205	Delphi Employee:	<input checked="" type="checkbox"/> Yes → <input checked="" type="checkbox"/> Salary <input type="checkbox"/> No → <input type="checkbox"/> Contract <input type="checkbox"/> Other	<input type="checkbox"/> Hourly
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Department Name/Number: EPS	Mail Code: 99-ENG		
Immediate Manager: Jeff Klass	Mail Code: 99- ENG	Telephone: (517)-757-3722	(Area Code) + Number
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Contract Employer: _____ (If applicable)		Telephone: _____	(Area Code) + Number
Contract Employer Address: _____	Street	City and State	Zip Code

### Inventor #2

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		48623	Zip Code	(Area Code) + Number	
Work Address:	3900 East. Holland Rd, Saginaw, Mi, 48601	Telephone:	(517)-757-3067 <small>989</small> (Area Code) + Number	Fax Number:	(517)-757-3039 <small>(Area Code) + Number</small>
Department Name/Number:	APC	Mail Code:	APC		
Immediate Manager:	Jim Petrowski	Mail Code:	APC	Telephone:	(517)-757-0652
2nd Level Manager:	Nady Boules	Mail Code:	APC	Telephone:	(517)-757-3001 <small>(Area Code) + Number</small>
Contract Employer:				Telephone:	
(if applicable) Contract Employer Address:	Street		City and State	Zip Code	

### Inventor #3

Name:	Brian	D	Lemanski	Citizen of:	USA
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		48634	Zip Code	(Area Code) + Number	
Work Address:	3900 East Holland Rd, Saginaw, Mi, 48601	Telephone:	(517)-757-9045 <small>(Area Code) + Number</small>	Fax Number:	(517)-757-4799 <small>(Area Code) + Number</small>
Department Name/Number:	EPS	Mail Code:	99-ENG		
Immediate Manager:	Jeff Klass	Mail Code:	99- ENG	Telephone:	(517)-757-3722 <small>(Area Code) + Number</small>
2nd Level Manager:	Mike Melvin	Mail Code:	99- ENG	Telephone:	(517)-757-5841 <small>(Area Code) + Number</small>
Contract Employer:				Telephone:	
(if applicable) Contract Employer Address:	Street		City and State	Zip Code	

\*\* If there are more than three (3) inventors, copy this page as needed. \*\*

Authorization

I hereby assign this invention to Delphi Technologies, Inc. and authorize  
Delphi Technologies, Inc. to file a patent application on my behalf.

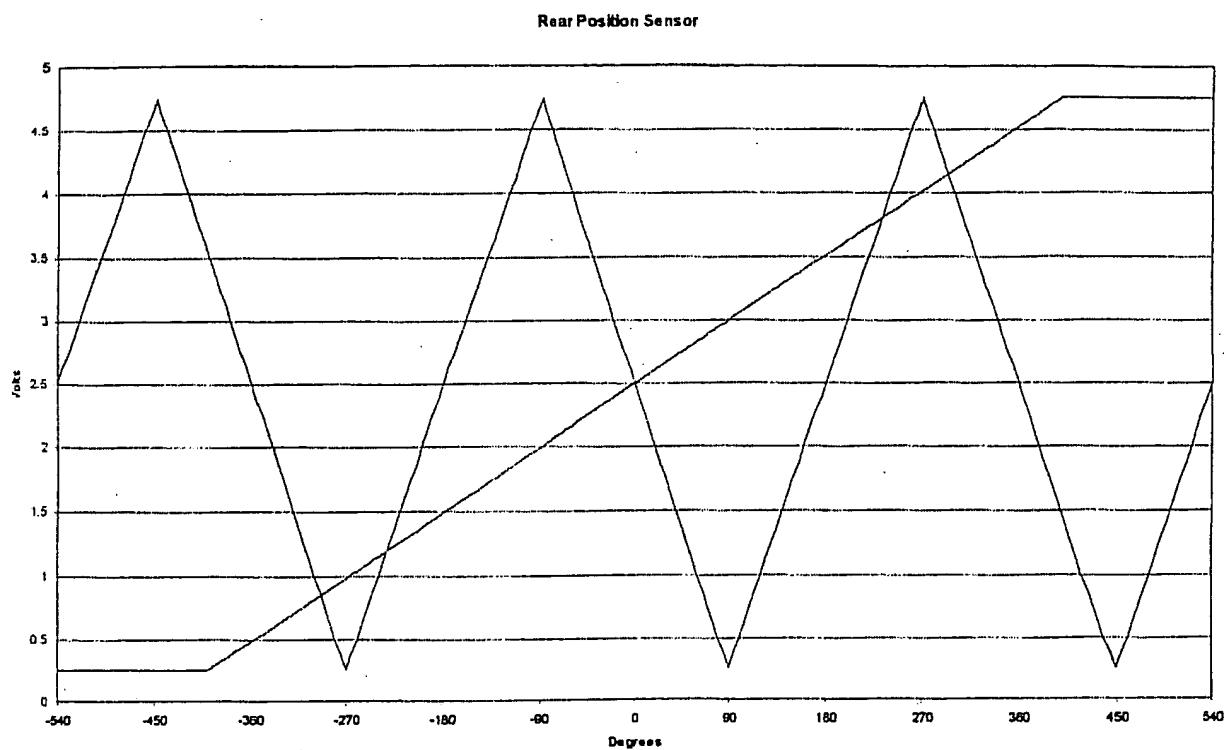
<u>Reeny S</u> INVENTOR - SIGNATURE	<u>REENY SEBASTIAN</u> (ALSO, PRINT NAME)	DATE
<u>Karen Boswell</u> INVENTOR - SIGNATURE	<u>KAREN BOSWELL</u> (ALSO, PRINT NAME)	
<u>Brian Lemassie</u> INVENTOR - SIGNATURE	<u>Brian Lemassie</u> (ALSO, PRINT NAME)	DATE

This invention was reviewed and understood by the witnesses below:

<u>Brian D. McGregor</u> 1st WITNESS - SIGNATURE	<u>Brian D. McGregor</u> (ALSO, PRINT NAME)	DATE
<u>Jeffrey T. Kllass</u> 2nd WITNESS - SIGNATURE	<u>JEFFREY T. KLASS</u> (ALSO, PRINT NAME)	DATE



**Figure (1); REAR POSITION SENSOR SIGNALS FOR THE QUADRASTEER SYSTEM**



WINDOW	ABSOLUTE SIGNAL
SIGNAL WINDOW (-2)	Bet 0.25 V and 1 V
SIGNAL WINDOW (-1)	Bet 1 V and 2 V
SIGNAL WINDOW (0)	Bet 2 V and 3 V
SIGNAL WINDOW (1)	Bet 3 V and 4 V
SIGNAL WINDOW (2)	Bet 4 V and 4.75 V

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FIG.(2) Block Diagram

For

Sensor

DIAGNOSTICS

Discrete Sample Block  
Data Server distinguishes  
Sample Period

0.04

0.05

0.06

0.07

0.08

0.09

0.10

0.11

0.12

0.13

0.14

0.15

0.16

0.17

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0.50

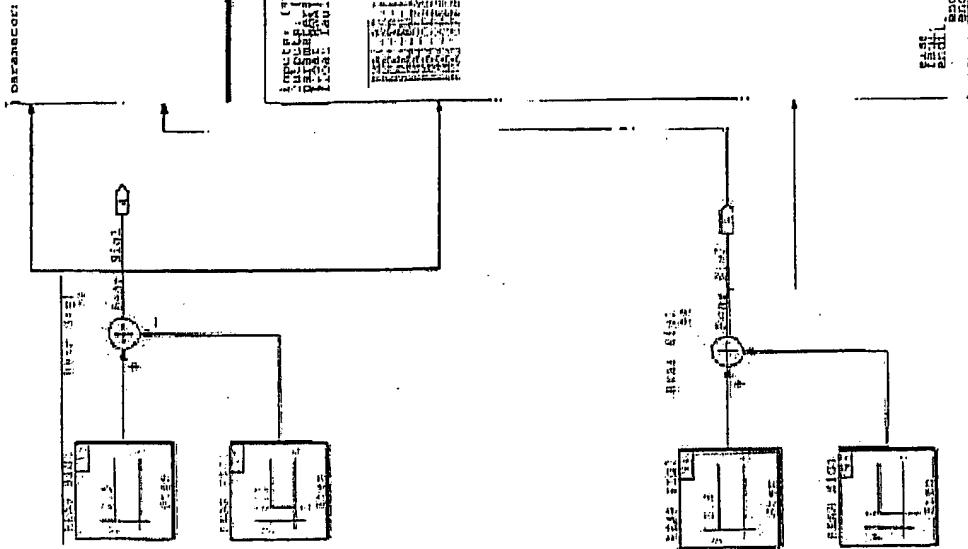
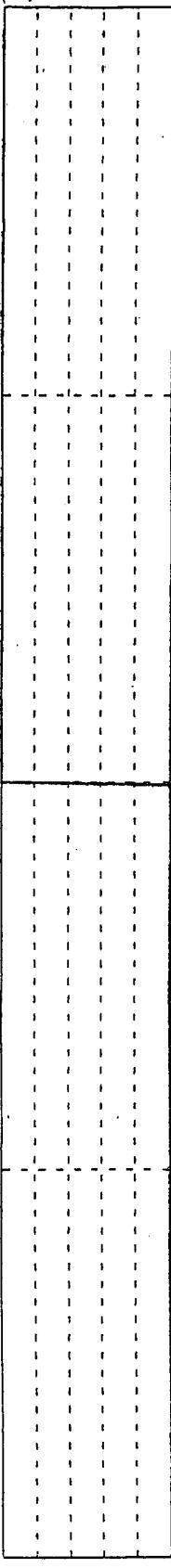
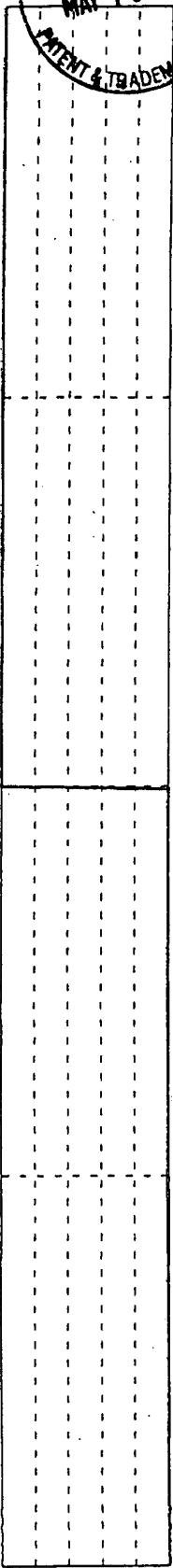


FIG.(3) , REAR SENSOR DIAGNOSTICS RESULTS

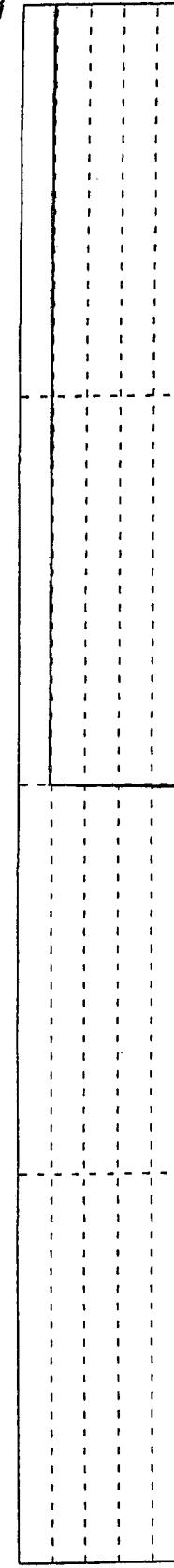


0.8  
0.6  
0.4  
0.2

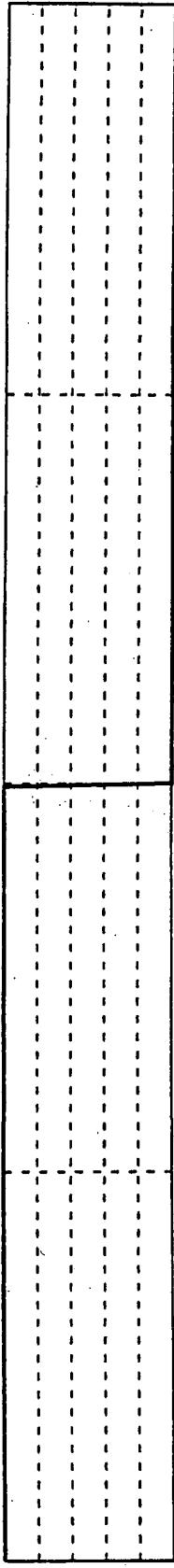
Fault-Engage



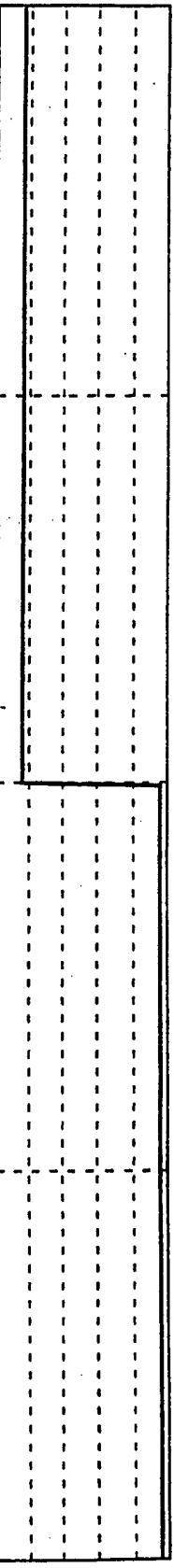
Fault-Corr



250000  
150000  
100000



SigB



Rear SigA

